

# Chapter 11

## Designing for Operation & Maintenance

### 11.1 Description

The operation and maintenance of a BMP is as critical to its performance as the design. Thus, it is crucial that maintenance issues be given serious consideration and thought during the design process to set up realistic maintenance expectations. Without proper maintenance, BMPs are likely to fail, providing little or no treatment of stormwater. Both the maintenance schedules and access provide challenges to BMP owners. Common maintenance issues that are encountered with existing designs include:

- A single family residential lot draining to buffer;
- Too frequent maintenance;
- Proposed maintenance burden on owner too great;
- Difficult access for equipment;
- Difficult to clean without complete renovation;
- Lack of maintenance easement or method for access;
- Lack of ability to see if unit is full;
- Lack of understanding of maintenance needs;



#### IMPORTANT

Pretreatment devices must be provided for all BMPs and should be sized to hold a minimum of one-year's worth of sediment.

- Problems with owner knowledge of system;
- Inability to backcharge owner if municipality must do the work.

Proper operation and maintenance ensures that the BMP will remain effective at removing pollutants as designed. It will:

- Increase volume of stormwater treated over the long term;
- Reduce BMP failure, therefore improving water quality;
- Decrease risk of resuspending sediment; and
- Increase pollutant removal efficiency.

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Designs need to consider reasonable, cost-effective maintenance frequencies, as well as provide access for ease of maintenance.

## 11.2 Design and Construction Criteria

1. **Provide Pre-Treatment:** Pre-treatment devices must be provided for each BMP.
2. **Sediment Removal Schedule:** All pre-treatment devices must be designed to accommodate a minimum of one year's worth of sediment. The estimated annual sediment accumulation must be provided as part of the design calculations.
3. **Size for Anticipated Sediment Loading:** Sediment loadings from both pervious and impervious areas must be considered and units should be sized to hold a year's worth of sediment.
  - Pervious Areas: The Universal Soil Loss Equation (USLE) should be used to calculate sediment deposits that would occur from pervious areas adjacent to the BMP.
  - Roadways and Parking Areas: Sand deposits from winter storm applications should be accounted for when designing a pre-treatment system. The design should be capable of holding a minimum of one-year's worth of sediment. Sediment loads should be calculated using a sand application rate of 500 lbs/acre for sanding of parking areas and access drives, a sand density of 90 lbs per cubic foot and assuming a minimum frequency of ten sandings per year.

Sanding rates and numbers of storms may need to be adjusted based on specific application rates in a community.
4. **Make Maintenance Needs Apparent:** BMPs must be designed to alert the owner when it is failing and maintenance is required. Bypasses should not be used unless there is risk to public health or safety.
5. **Design for Anticipated Pollutants:** Pre-treatment devices must be designed to capture anticipated pollutants, such as oil and grease.
6. **Accessibility:** All devices must be designed and located to be easily accessible for inspection and for the appropriate equipment needed for maintenance. Formal access must be provided.
7. **Easements:** Permanent maintenance easements must be provided to the entity responsible for maintenance when that entity does not own the property.
8. **Operation and Maintenance Plan:** The proper operation and maintenance of a device must be laid out in an operation and maintenance plan that clearly identifies required inspection activities, the maintenance schedule and provides a method for determining when maintenance is necessary. The operations and maintenance plan must also outline manpower and budget needs to perform maintenance. Specific maintenance needs for each type of BMP are provided in their respective sections. A summary table of the inspection and maintenance needs of each BMP type is included in Table 11-1.

To obtain an annual sediment volume, perform the following calculation:

$$\frac{\text{Area to be sanded (acres)}}{\text{acre-storm}} \times 500 \frac{\text{pounds}}{\text{acre-storm}} \div 90 \frac{\text{pounds}}{\text{ft}^3} \times 10 \frac{\text{storms}}{\text{year}} = \text{cubic feet of sediment/yr}$$

- 9. Sediment Marker:** A sediment marker should be provided to enable the inspectors to get an accurate and consistent depth of sediment under the current conditions.
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### **Selected References**

Comprehensive Environmental Inc., November 2003. *Design Guidelines and Criteria for Stormwater Management*. Milford, MA.

**Table 11-1**  
**Long-Term Inspection & Maintenance Plan**

	Spring	Fall or Yearly	After a Major Storm	Every 2-5 Years
<b>Vegetated Areas</b>				
Inspect all slopes and embankments	X		X	
Replant bare areas or areas with sparse growth	X		X	
Armor areas with rill erosion with an appropriate lining or divert the erosive flows to on-site areas able to withstand concentrated flows. See Appendix A(5) of Rule.	X		X	
<b>Stormwater Channels</b>				
Inspect ditches, swales and other open stormwater channels	X	X	X	
Remove any obstructions and accumulated sediments or debris	X	X		
Control vegetated growth and woody vegetation		X		
Repair any erosion of the ditch lining		X		
Mow vegetated ditches		X		
Remove woody vegetation growing through riprap		X		
Repair any slumping side slopes		X		
Replace riprap where underlying filter fabric or underdrain gravel is showing or where stones have dislodge		X		
<b>Culverts</b>				
Remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit	X	X	X	
Repair any erosion damage at the culvert's inlet and outlet	X	X	X	
<b>Catch Basin Systems</b>				
Remove and legally dispose of accumulated sediments and debris from the bottom of the basin, inlet grates, inflow channels to the basin, and pipes between basins.	X	X		
Remove floating debris and floating oils (using oil absorptive pads) from any trap designed for such	X	X		
<b>Roadways and Parking Surfaces</b>				
Clear accumulated winter sand in parking lots and along roadways	X			
Sweep pavement to remove sediment	X			
Grade road shoulders and remove excess sand either manually or by a front-end loader	X			
Grade gravel roads and gravel shoulders	X			
Clean-out the sediment within water bars or open-top culverts	X			
Ensure that stormwater is not impeded by accumulations of material or false ditches in the shoulder	X			

**Table 11-1**  
**Long-Term Inspection & Maintenance Plan**

	Spring	Fall or Yearly	After a Major Storm	Every 2-5 Years
Buffers				
Inspect treatment buffers for evidence of erosion, concentrated flow, or encroachment by development		X		
Manage the buffer's vegetation with the requirements in any deed restrictions		X		
Mow vegetation in non-wooded buffers no shorter than six inches and less than three times per year		X		
Repair any sign of erosion within a buffer		X		
Inspect and repair down-slope of all spreaders and turn-outs for erosion		X		
Install more level spreaders, or ditch turn-outs if needed for a better distribution of flow		X		
Clean-out any accumulation of sediment within the spreader bays or turn-out pools		X		
Stormwater Detention and Retention Facilities				
Inspect the embankments for settlement, slope erosion, internal piping, and downstream swamping. A professional engineer must review these immediately.		X	X	
Mow the embankment to control woody vegetation		X		
Inspect the outlet control structure for broken seals, obstructed orifices, and plugged trash racks		X	X	
Remove and dispose of sediments and debris within the control structure		X		
Repair any damage to trash racks or debris guards		X		
Mow vegetated spillways to control woody vegetation and replace any dislodged stone in riprap spillways		X		
Remove and dispose of accumulated sediments within the impoundment and forebay				X
Runoff Infiltration Facilities				
Inspect and clean-out any pre-treatment measures that collect sediment and hydrocarbons entering an infiltration measure	X	X		
Provide for the removal and disposal of accumulated sediments within the infiltration area				X
Renew the infiltration measure if it fails to drain within 72 hours after a rainfall of one-half inch or more				X
Till and replant the soil of vegetated infiltration basins				X
Reconstruct rock-lined basins or stone-filled trenches by removing the stones, replacing new underlying filter fabric, and tilling or removing the underlying soil				X
Proprietary Treatment Devices				
Contract with a third-party for the removal of accumulated sediments, oils, and debris within the device and replacement of any absorptive filters	The frequency of maintenance is established by the unit's storage capacity, the pollutant load and the manufacturer recommendations			
Other Practices and Measures				
Contact the department for appropriate inspection and maintenance requirements for other drainage control and runoff treatment measures.				

The maintenance needs for most vegetative and stabilization measures may be found in the Maine Erosion and Sediment Control BMPs manual as published in 2003.